USDA Natural Resources
Conservation Service

Ecological site R034AY310WY
Dense Clay High Plains Southeast (DC)

Accessed: 05/11/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site will usually occur in a lowland position, on flat to moderately sloping land. It is found on all exposures. Slopes are mostly 5 to 40%.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Stream terrace
Flooding frequency	None
Ponding frequency	None
Elevation	5,500–7,500 ft
Slope	0–60%
Ponding depth	0 in
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 10-14 inches per year. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation. Temperatures show a wide range between summer and winter and between daily maximums and minimums. This is predominantly due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring.

Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of native cool season plants begins about April 15 and continues to about June 15. Some green up of cool season plants usually occurs in September.

The following information is from the “Laramie” climate station:
Minimum Maximum 5 yrs. out of 10 between
Frost-free period (days): 57 149 June 1 – September 16

Freeze-free period (days): 94 183 May 15 – September 28
Annual Precipitation (inches): 5.8 17.34

Mean annual precipitation: 11.53 inches
Mean annual air temperature: 42.2 F (30.4 F Avg. Min. to 53.9 F Avg. Max.)
For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/ website. Other climate station(s) representative of this precipitation zone include ”Dixon ” and “Medicine Bow”.

Table 3. Representative climatic features

Frost-free period (average)	149 days
Freeze-free period (average)	183 days
Precipitation total (average)	14 in

Influencing water features

Stream type: None

Soil features

The soils of this site are moderately deep to very deep (greater than 20” to bedrock), well to poorly drained soils formed in alluvium. These soils have slow to very slow permeability. The topsoil, except for thin ineffectual layers, will be heavy clays and/or soils that develop large cracks when dry and are very sticky when wet. These soils are not high in salinity and /or alkalinity.

Table 4. Representative soil features

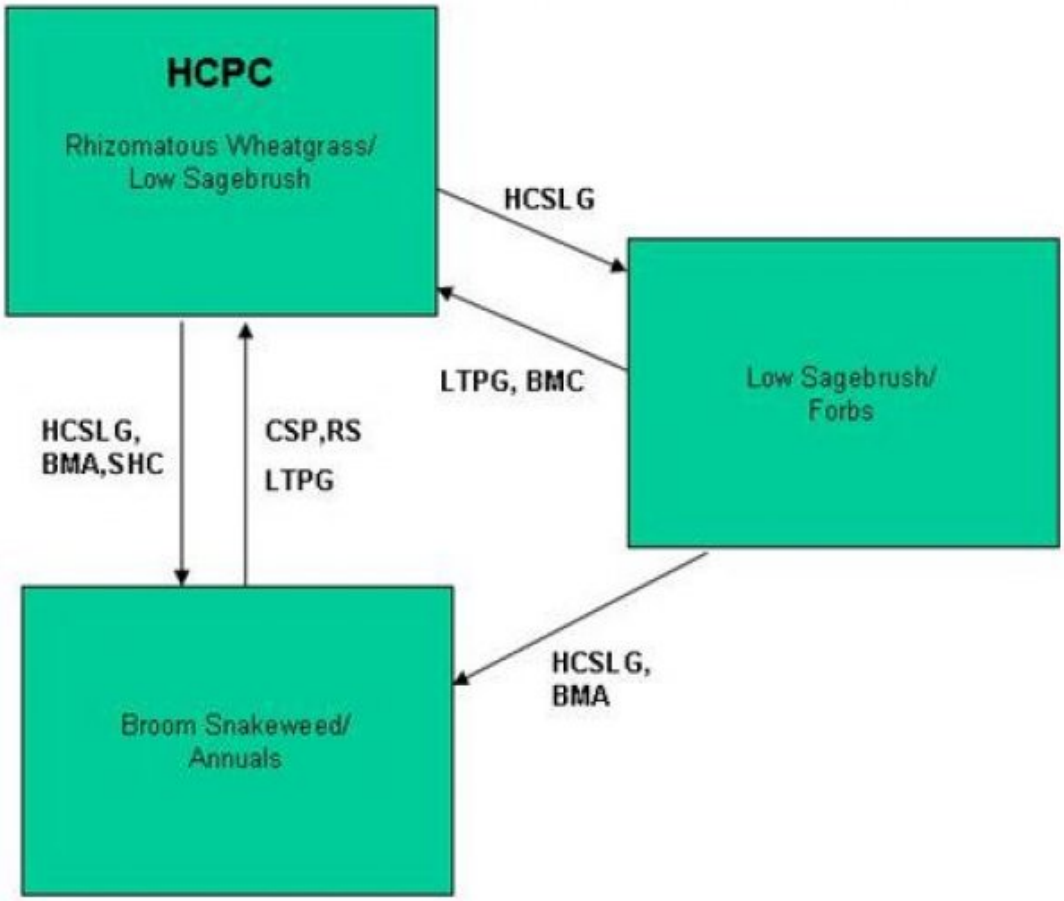
Surface texture	(1) Clay (2) Silty clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow to very slow
Soil depth	20–60 in
Available water capacity (0-40in)	3–4.5 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–8.4

Ecological dynamics

As this site deteriorates from improper grazing management, low sagebrush and green rabbitbrush will increase. Bunchgrasses will decrease in frequency and production.
The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

The following is a State and Transition Model Diagram that illustrates the common plant communities (states) that can occur on the site and the transitions between these communities. The ecological processes will be discussed in more detail in the plant community narratives following the diagram.

State and transition model



BMA – Brush Management (all methods)
BMC – Brush Management (chemical)
BMF – Brush Management (fire)
BMM – Brush Management (mechanical)
CSP – Chemical Seedbed Preparation
CSLG – Continuous Season-long Grazing
DR – Drainage
CSG – Continuous Spring Grazing
HB – Heavy Browse
HCSLG – Heavy Continuous Season-long Grazing
HI – Heavy Inundation
LPG – Long-term Prescribed Grazing
MT – Mechanical Treatment (chiseling, ripping, pitting)
MCSLG – Moderate Continuous Season Long Grazing

NF – No Fire
NS – Natural Succession
NWC – Noxious Weed Control
NWI – Noxious Weed Invasion
NU – Nonuse
P&C – Plow & Crop (including hay)
PG – Prescribed Grazing
RPT – Re-plant Trees
RS – Re-seed
SGD – Severe Ground Disturbance
SHC – Severe Hoof Compaction
WD – Wildlife Damage (Beaver)
WF – Wildfire

State 1
Rhizomatous Wheatgrass/Low Sagebrush Plant Community (HCPC)

Community 1.1
Rhizomatous Wheatgrass/Low Sagebrush Plant Community (HCPC)

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and is suited for grazing by domestic livestock. Potential vegetation is estimated at 70% grasses or grass-like plants, 10% forbs and 20% woody plants. The major grasses include rhizomatous wheatgrass, bottlebrush squirreltail, and mutton bluegrass. Other grasses and grass-like plants may include prairie junegrass, Indian ricegrass, plains reedgrass, and Canby and Sandberg bluegrass. Low sagebrush is the major woody plant. Other woody plants that may occur include green rabbitbrush, and winterfat. A typical plant composition for this state consists of rhizomatous wheatgrass 30-40%, bottlebrush squirreltail 5-15%, mutton bluegrass 5-10%, other grasses and grass-like plants 10-20%, perennial forbs 5-10%, low sagebrush 10-20%, and 5-10% other woody species. Ground cover, by ocular estimate, varies from 55-60%. The total annual production (air-dry weight) of this state is about 750 pounds per acre, but it can range from about 450 lbs./acre in unfavorable years to about 1000 lbs./acre in above average years. This state is extremely stable and well adapted to the Cool Central Desertic Basins and Plateaus climatic conditions. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity). Transitions or pathways leading to other plant communities are as follows: • Heavy Continuous Season-long Grazing will convert this plant community to the Low Sagebrush/Forb Plant Community. • Heavy Continuous Season-long Grazing following Brush Management and Severe Hoof Compaction will convert this plant community to the Broom Snakeweed/Annuals Plant Community.

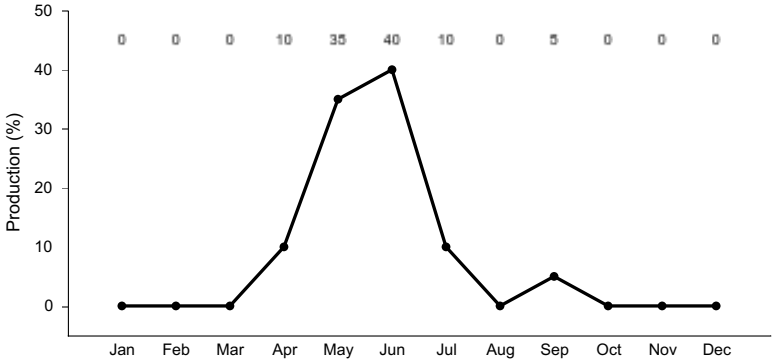


Figure 2. Plant community growth curve (percent production by month). WY0901, 34AI, Upland Sites. All Upland Sites.

State 2
Low Sagebrush/Forb Plant Community

Community 2.1
Low Sagebrush/Forb Plant Community

This plant community is the result of heavy continuous season long grazing. Low sagebrush dominates with annual production often exceeding 30-40%. There is mostly bare ground between sagebrush plants with an understory of grass and forbs limited to the protected areas under shrubs. The major grasses include Sandberg bluegrass and rhizomatous wheatgrass. The total annual production (air-dry weight) of this state is about 500 pounds per acre, but it can range from about 300 lbs./acre in unfavorable years to about 700 lbs./acre in above average years. Soil erosion is accelerated because of increased bare ground. The biotic community has been compromised, but is relatively stable. The watershed is functioning, but is at risk of further degradation. Water flow patterns and pedestals are obvious. Infiltration is reduced and runoff is increased. Transitional pathways leading to other plant communities are as follows: • Brush Management (chemical) and Long Term Prescribed Grazing will result in a plant community very similar to the Historic Climax Plant Community (Rhizomatous Wheatgrass/Low Sagebrush Plant Community). • Heavy Continuous Season-long Grazing following Brush Management will convert this plant community to the Broom Snakeweed/Annuals Plant Community.

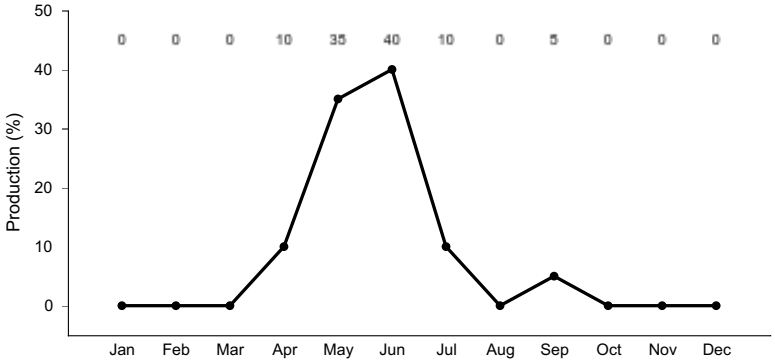


Figure 3. Plant community growth curve (percent production by month). WY0901, 34AI, Upland Sites. All Upland Sites.

State 3
Broom Snakeweed/ Annuals Plant Community

Community 3.1
Broom Snakeweed/ Annuals Plant Community

This plant community is the result of improper grazing in combination with brush management practices and severe compaction. Low sagebrush and rhizomatous wheatgrass are replaced with broom snakeweed and annuals such as cheatgrass, pepperweed, and woolly Indianwheat. Annual production is greatly reduced with bare ground dominating the site. The total annual production (air-dry weight) of this state is about 100 pounds per acre, but it can range from about 50 lbs./acre in unfavorable years to about 200 lbs./acre in above average years. Soil erosion is accelerated because of increased bare ground. The biotic community has been compromised, but is relatively stable. The watershed is non-functioning. Water flow patterns and pedestals are obvious. Infiltration is reduced and runoff is increased. Transitional pathways leading to other plant communities are as follows: • Chemical Seedbed Preparation, Reseeding, and Long Term Prescribed Grazing will result in a plant community similar to the Historic Climax Plant Community (Rhizomatous Wheatgrass/Low Sagebrush Plant Community).

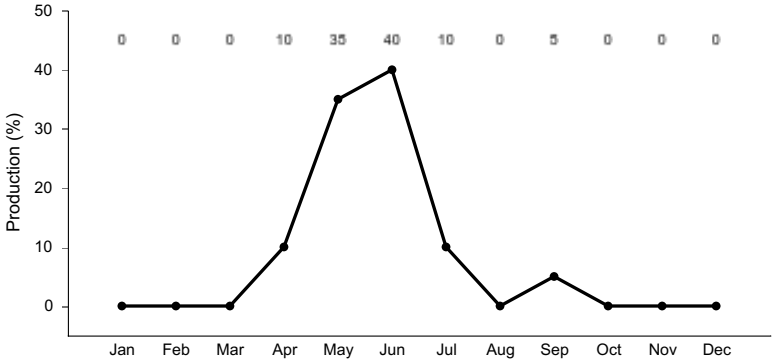


Figure 4. Plant community growth curve (percent production by month). WY0901, 34AI, Upland Sites. All Upland Sites.

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				225–300	
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	225–300	–
	western wheatgrass	PASM	*Pascopyrum smithii*	225–300	–
2				38–113	
	squirreltail	ELEL5	*Elymus elymoides*	38–113	–
3				38–113	
	muttongrass	POFE	*Poa fendleriana*	38–113	–
4				75–188	
	Grass, perennial	2GP	*Grass, perennial*	0–38	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–38	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–38	–
	needle and thread	HECO26	*Hesperostipa comata*	0–38	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–38	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–38	–
Forb					
5				38–113	
	yarrow	ACHIL	*Achillea*	0–38	–
	wild onion	ALAS2	*Allium ascalonicum*	0–38	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–38	–
	milkvetch	ASTRA	*Astragalus*	0–38	–
	bastard toadflax	COUM	*Comandra umbellata*	0–38	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	0–38	–
	fleabane	ERIGE2	*Erigeron*	0–38	–
	buckwheat	ERIOG	*Eriogonum*	0–38	–
	aster	EUCEP2	*Eucephalus*	0–38	–
	desertparsley	LOMAT	*Lomatium*	0–38	–
	bluebells	MERTE	*Mertensia*	0–38	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–38	–
	phlox	PHLOX	*Phlox*	0–38	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–38	–
	groundsel	TEPHR3	*Tephroseris*	0–38	–
	Forb, perennial	2FP	*Forb, perennial*	0	–
Shrub/Vine					
6				75–150	
	little sagebrush	ARAR8	*Artemisia arbuscula*	75–150	–
7				38–75	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–38	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–38	–
	winterfat	KRASC	*Krascheninnikovia*	0–38	–

Animal community

Animal Community – Wildlife Interpretations
Rhizomatous Wheatgrass/Low Sagebrush Plant Community (HCPC): Suitable thermal and escape cover for mule deer may be limited due to the low height and density of woody plants. However, sagebrush, which can approach 15% protein and 40-60% digestibility, provides important winter forage for mule deer and antelope. Year-round habitat is provided for sage grouse and many other sagebrush obligate species such as the sage sparrow, sage thrasher, pygmy rabbit, sagebrush vole, horned lizard, and pronghorn antelope. Open spaces in the sagebrush canopy are potential sage grouse lek locations. Other birds that would frequent this plant community include horned larks and golden eagles.

Low Sagebrush/Forb Plant Community: This plant community may be beneficial for the same wildlife that would use the Historic Climax Plant Community. However, the plant community composition is less diverse, and thus, less apt to meet the seasonal needs of these animals.

Broom Snakeweed/Annuals Plant Community: This plant community has a low level of diversity. forage for browsing and grazing animals is limited. Areas of bare ground may provide lek locations for sage grouse.

Animal Community – Grazing Interpretations
The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. Under more intensive grazing management, improved harvest efficiencies can result in an increased carrying capacity. If distribution problems occur, stocking rates must be reduced to maintain plant health and vigor.

Plant Community Production Carrying Capacity*
(lb./ac) (AUM/ac)
Rhizomatous Wheatgrass/Low Sage (HCPC) 450-1000 0.2
Low Sagebrush/Forb 300-700 0.18
Broom Snakeweed/Annuals 50-200 0.01

* - Continuous, season-long grazing by cattle under average growing conditions.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for cattle, sheep, or horses. During the dormant period, the forage for livestock use needs to be supplemented with protein because the quality does not meet minimum livestock requirements.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration is very slow. Runoff potential for this site is very high depending on ground cover. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (refer to Part 630, NRCS National Engineering Handbook for detailed hydrology information).

Rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogrammic crusts are present, but only cover 1-2% of the soil surface.

Recreational uses

This site provides limited hunting opportunities.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Inventory data references

Inventory Data References (narrative)
Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used. Other sources used as references include: USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

Inventory Data References
Data Source Number of Records Sample Period State County
SCS-RANGE-417 69 1967-1988 WY Carbon
& others

Contributors

B. Brazee

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/05/2005
Approved by	E. Bainter
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present on slopes <6% and will be short, broken and discontinuous on slopes > 7%.

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2. **Presence of water flow patterns:** Barely observable on slopes < 6% and evident on slopes >7%.

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3. **Number and height of erosional pedestals or terracettes:** Not evident on slopes < 6%. Erosional pedestals may be present with small terracettes present at debris dams on slopes >7%.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 40 to 60%.

5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present

6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. If litter movement occurs, it is only for a short distance.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Plant cover and litter is at 40% or greater of soil surface and maintains soil surface integrity. Stability class anticipated to be 3 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth and color of A-horizon.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Sparse plant canopy (20% maximum), very slow to slow infiltration rates, and the high amount of bare ground contribute to a naturally high runoff rate even in HCPC.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer is expected.

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional: Mid-stature cool season rhizomatous grass > mid-stature, cool season bunch grasses > short stature grasses/grasslikes > shrubs > forbs

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Some plant mortality and decadence (5 to 10%) is expected on this site.

14. **Average percent litter cover (%) and depth (in):** Litter cover is in contact with soil surface.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 750 lbs/ac

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Plains prickly pear, broom snakeweed, annual bromes, and species found on the noxious weed list.

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17. **Perennial plant reproductive capability:** No limitations.
